

No.

200200257

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

Pioneer Hi-Bred International, Inc.

Whereas, THERE HAS BEEN PRESENTED TO THE

Secretary of Agriculture

AN APPLICATION REQUESTING A CERTIFICATE OF PROTECTION FOR AN ALLEGED DISTINCT VARIETY OF SEXUALLY REPRODUCED, OR TUBER PROPAGATED PLANT, THE NAME AND DESCRIPTION OF WHICH ARE CONTAINED IN THE APPLICATION AND EXHIBITS, A COPY OF WHICH IS HEREUNTO ANNEXED AND MADE A PART HEREOF, AND THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED HAVE BEEN COMPLIED WITH, AND THE TITLE THERETO IS FROM THE RECORDS OF THE PLANT VARIETY PROTECTION OFFICE, IN THE APPLICANT(S) INDICATED IN THE SAID COPY, AND WHEREAS, UPON DUE EXAMINATION MADE, THE SAID APPLICANT(S) IS (ARE) ADJUDGED TO BE ENTITLED TO A CERTIFICATE OF PLANT VARIETY PROTECTION UNDER THE LAW.

NOW, THEREFORE, THIS CERTIFICATE OF PLANT VARIETY PROTECTION IS TO GRANT UNTO THE SAID APPLICANT(S) AND THE SUCCESSORS, HEIRS OR ASSIGNS OF THE SAID APPLICANT(S) FOR THE TERM OF TWENTY YEARS FROM THE DATE OF THIS GRANT, SUBJECT TO THE PAYMENT OF THE REQUIRED FEES AND PERIODIC REPLENISHMENT OF VIABLE BASIC SEED OF THE VARIETY IN A PUBLIC REPOSITORY AS PROVIDED BY LAW, THE SAID APPLICANT(S) TO EXCLUDE OTHERS FROM SELLING THE VARIETY, OR OFFERING IT FOR SALE, OR REPRODUCING IT, OR OFFERING IT, OR EXPORTING IT, OR CONDITIONING IT FOR PROPAGATION, OR STOCKING IT FOR ANY OF THE ABOVE PURPOSES, OR CONDITIONING IT FOR PROPAGATION, OR STOCKING IT FOR ANY OF THE ABOVE PURPOSES, OR USING IT IN PRODUCING A HYBRID OR DIFFERENT VARIETY THEREFROM, TO THE EXTENT PROVIDED IN THE PLANT VARIETY PROTECTION ACT. (84 STAT. 1542, AS AMENDED, 7 U.S.C. 2321 ET SEQ.)

CORN, FIELD

'PH3RC'

In Testimony Whereof, I have hereunto set my hand and caused the seal of the Plant Variety Protection Office to be affixed at the City of Washington, D.C. this fifth day of July, in the year two thousand and six.

Attest:

B. M. Z...

Commissioner
Plant Variety Protection Office
Agricultural Marketing Service

W. L. Johnson

Secretary of Agriculture

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
SCIENCE AND TECHNOLOGY DIVISION - PLANT VARIETY PROTECTION OFFICE

APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE
(Instructions and Information collection burden statement on reverse)

The following statements are made in accordance with the Privacy Act of 1974 (5 U.S.C. 552a) and the Paperwork Reduction Act (PRA) of 1995.

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426).

1. NAME OF OWNER Pioneer Hi-Bred International, Inc.		2. TEMPORARY DESIGNATION OR EXPERIMENTAL NUMBER PH3RC		3. VARIETY NAME PH3RC	
4. ADDRESS (Street and No. or RFD No., City, State and Zip Code, and Country) 7301 NW 62 nd Avenue P.O. Box 85 Johnston, IA 50131-0085		5. TELEPHONE (include area code) 515/270-4051		FOR OFFICIAL USE ONLY PVPO NUMBER <div style="font-size: 2em; font-weight: bold;">20020025</div>	
6. FAX (include area code) 515/253-2125		7. DATE OF INCORPORATION March 5, 1999			
7. IF THE OWNER NAMED IS NOT A "PERSON", GIVE FORM OF ORGANIZATION (corporation, partnership, association, etc.) Corporation		8. IF INCORPORATED, GIVE STATE OF INCORPORATION IOWA		FILING DATE Sept. 10, 2002	
10. NAME AND ADDRESS OF OWNER REPRESENTATIVE(S) TO SERVE IN THIS APPLICATION (FIRST PERSON LISTED WILL RECEIVE ALL PAPERS) Steven R. Anderson Research and Product Development P.O. Box 85 Johnston, IA 50131-0085				FILING & EXAMINATION FEES: \$ 2705.00 DATE 9/10/02 CERTIFICATION FEE: \$ 768.00 DATE 4/10/06	
11. TELEPHONE (include area code) 515/270-4051	12. FAX (include area code) 515/253-2125	13. E_MAIL Steven.Anderson@Pioneer.com		14. CROP KIND NAME (Common name) CORN	
15. GENUS AND SPECIES NAME OF CROP Zea Mays		16. FAMILY NAME (Botanical) Gramineae		17. IS THE VARIETY A FIRST GENERATION HYBRID? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
18. CHECK APPROPRIATE BOX FOR EACH ATTACHMENT SUBMITTED (Follow Instructions on reverse) a. <input checked="" type="checkbox"/> Exhibit A. Origin and Breeding History of the Variety b. <input checked="" type="checkbox"/> Exhibit B. Statement of Distinctness c. <input checked="" type="checkbox"/> Exhibit C. Objective Description of the Variety d. <input type="checkbox"/> Exhibit D. Additional Description of the Variety (Optional) e. <input checked="" type="checkbox"/> Exhibit E. Statement of the Basis of the Owner's Ownership f. <input checked="" type="checkbox"/> Voucher Sample (2500 viable untreated seeds or, for tuber propagated varieties verification that tissue culture will be deposited and maintained in an approved public repository) g. <input checked="" type="checkbox"/> Filing and Examination Fee (\$2,705), made payable to "Treasurer of the United States" (Mail to Plant Variety Protection Office)				19. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE SOLD AS A CLASS OF CERTIFIED SEED? See Section 83(a) of the Plant Variety Protection Act) <input type="checkbox"/> YES (If "yes", answer Items 20 and 21 below) <input checked="" type="checkbox"/> NO (If "no", go to Item 22)	
22. HAS THE VARIETY (INCLUDING ANY HARVESTED MATERIAL) OR A HYBRID PRODUCED FROM THIS VARIETY BEEN SOLD, DISPOSED OF, TRANSFERRED, OR USED IN THE U.S. OR OTHER COUNTRIES? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO IF YES, YOU MUST PROVIDE THE DATE OF FIRST SALE, DISPOSITION, TRANSFER, OR USE FOR EACH COUNTRY AND THE CIRCUMSTANCES. (Please use space indicated on reverse)				20. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE LIMITED AS TO NUMBER OF CLASSES? <input type="checkbox"/> YES <input type="checkbox"/> NO IF "YES" WHICH CLASSES? <input type="checkbox"/> FOUNDATION <input type="checkbox"/> REGISTERED <input type="checkbox"/> CERTIFIED	
				21. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE LIMITED AS TO NUMBER OF GENERATIONS? <input type="checkbox"/> YES <input type="checkbox"/> NO IF "YES" SPECIFY THE? <input type="checkbox"/> FOUNDATION <input type="checkbox"/> REGISTERED <input type="checkbox"/> CERTIFIED Number 1,2,3 etc. (If additional explanation is necessary, please use the space indicated on the reverse.)	
23. IS THE VARIETY OR ANY COMPONENT OF THE VARIETY PROTECTED BY INTELLECTUAL PROPERTY RIGHT (PLANT BREEDER'S RIGHT OR PATENT)? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO IF YES, PLEASE GIVE COUNTRY, DATE OF FILING OR ISSUANCE AND ASSIGNED REFERENCE NUMBER. (Please use space indicated on reverse.)				24. The owner(s) declare that a viable sample of basic seed of the variety will be furnished with application and will be replenished upon request in accordance with such regulations as may be applicable, or for a tuber propagated variety a tissue culture will be deposited in a public repository and maintained for the duration of the certificate. The undersigned owner(s) is(are) the owner of this sexually reproduced or tuber propagated plant variety, and believe(s) that the variety is new, distinct, uniform, and stable as required in Section 42, and is entitled to protection under the provisions of Section 42 of the Plant Variety Protection Act. Owner(s) is(are) informed that false representation herein can jeopardize protection and results in penalties.	
CAPACITY OR TITLE Research Scientist		DATE 8-27-2002		Owner(s) is(are) informed that false representation herein can jeopardize protection and results in penalties.	

INSTRUCTIONS

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GENERAL: To be effectively filed with the Plant Variety protection Office (PVPO), ALL of the following items must be received in the PVPO: (1) Completed application form signed by the owner; (2) completed Exhibits A, B, C, E; (3) for a seed reproduced variety at least 2,500 viable untreated seeds, for a hybrid variety at least 2,500 untreated seeds of each line necessary to reproduce the variety, or for tuber reproduced varieties verification that a viable (*in the sense that it will reproduce an entire plant*) tissue culture will be deposited and maintained in a approved public repository; (4) check drawn on a U.S. bank for \$2705 (\$320 filing fee and \$2,385 examination fee), payable to "Treasurer of the United States" (See Section 97.6 of the Regulations and Rules of Practice.) Partial applications will be held in the PVPO for not more than 90 days, then returned to the applicant as unfilled. Mail application and other requirements to Plant Variety Protection Office, AMS, USDA, Room 400, NAL Building, 10301 Baltimore Avenue, Beltsville, MD 20705-2351. Retain one copy for your files. All items on the face of the application are self explanatory unless noted below. Corrections on the application form and exhibits must be initialed and dated. DO NOT use masking materials to make corrections. If a certificate is allowed, you will be requested to send a check payable to "Treasurer of the United States" in the amount of \$320 for issuance of the certificate. Certificates will be issued to owner, not licensee or agent.

Plant Variety Protection Office

Telephone: (301)504-5518

FAX: (301)504-5291

Homepage: <http://www.ams.usda.gov/science/pvp.htm>

ITEM

- 18a. Give: (1) the genealogy, including public and commercial varieties, lines, or clones used, and the breeding method;
(2) the details of subsequent stages of selection and multiplication;
(3) evidence of uniformity and stability; and
(4) the type and frequency of variants during reproduction and multiplication and state how these variants may be identified.
- 18b. Give a summary of the variety's distinctness. Clearly state how this application variety may be distinguished from all other varieties in the same crop. If the new variety is most similar to one variety or a group of related varieties:
(1) identify these varieties and state all differences objectively;
(2) attach statistical data for characters expressed numerically and demonstrate that these are clear differences; and
(3) submit, if helpful, seed and plant specimens of photographs (prints) of seed and plant comparisons which clearly indicate distinctness.
- 18c. Exhibit C forms are available from the PVPO for most crops; specify crop kind. Fill in Exhibit C (Objective Description of Variety) form as completely as possible to describe your variety.
- 18d. Optional additional characteristics and/or photographs. Describe any additional characteristics that cannot be accurately conveyed in Exhibit C. Use comparative varieties as is necessary to reveal more accurately the characteristics that are difficult to describe, such as plant habit, plant disease resistance, etc.
- 18e. Section 52(5) of the Act required applicants to furnish a statement of the basis of the applicant's ownership. An Exhibit E form is available from the PVPO.
19. If "Yes" is specified (*seed of this variety be sold by variety name only, as a class of certified seed*), the applicant MAY NOT reverse this affirmative decision after the variety has been sold and so labeled, the decision published, or the certificate issued. However, if "No" has been specified, applicant may change the choice. (See Regulations and Rules of Practice, Section 7.103).
22. See Sections 41, 42, and 43 of the Act and Section 97.5 of the regulations for eligibility requirements.
23. See Section 5.5 of the Act for instructions on claiming the benefit of an earlier filing date
-
21. CONTINUED FROM FRONT (*Please provide a statement as to the limitation and sequence of generations that may be certified.*)
-
22. CONTINUED FROM FRONT (*Please provide the date of first sale, disposition, transfer, or use for each country and the circumstances, if the variety (including any harvested material) or a hybrid produced from this variety has been sold, disposed of, transferred, or used in the U>S> or other countries.*)
- Nov. 1, 2000 Italy, Nov. 1, 2001 United States, Nov. 1, 2001 Portugal, Nov. 1, 2001 South Africa, Nov. 1, 2001 Spain
-
23. CONTINUED FROM FRONT (*Please give the country, date of filing or issuance, and assigned reference number, if the variety or any component of the variety is protected by intellectual property right (Plant Breeder's Right or Patent).*)

NOTES: It is the responsibility of the applicant/owner to keep the PVPO informed of any changes of address or change of ownership or assignment or owner's representative during the life of the application/certificate. There is no charge for filing a change of address. The fee for filing a change of ownership or assignment or any modification of owner's name is specified in Section 97.175 of the regulations. (See Section 101 of the Act, and Sections 97.130, 97.131, 97.175(h) of Regulations and Rules of Practice.)

To avoid conflict with other variety names in use, the applicant should check the variety names proposed by contacting: Seed Branch, AMS, USDA, Room 213, Building 306, Beltsville Agricultural Research Center--East, Beltsville, MD 20705. Telephone: (301) 504-8089. <http://www.ams.usda.gov/lsg/seed/lsg-sd.htm>

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this collection of information is 1(0582-005). The time required to complete this information collection is estimated to average 1.4 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in its programs on the basis of race, color, national origin, sex, religion, age, disability, political beliefs, and marital or familial status. (Not all prohibited bases apply to all programs). Persons with disabilities who require alternative means for communication of program information (braille, large print, audiotape, etc.) should contact the USDA Office of Communications at (202) 720-2791. To file a complaint, write the Secretary of Agriculture, U.S. Department of Agriculture, Washington, D.C. 20250, or call (202) 720-7327 (voice) or (202) 720-1127 (TDD). USDA is an equal employment opportunity employer.

Exhibit A. Origin and Breeding History

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Pedigree: PHHB4/PHFT4)X853231141

Pioneer Line PH3RC, *Zea mays L.*, a dent-like corn inbred, was developed by Pioneer Hi-Bred International, Inc. from the single cross hybrid PHHB4 (Certificate No. 9400093) X PHFT4 using the pedigree method of plant breeding. Varieties PHHB4 and PHFT4 are proprietary inbred lines of Pioneer Hi-Bred International, Inc. Selfing was practiced from the above hybrid for 11 generations using pedigree selection. During line development, crosses were made to inbred testers for the purpose of estimating the line's combining ability. Yield trials were grown at Macomb, Illinois, as well as other Pioneer research locations. After initial testing, additional hybrid combinations have been evaluated and subsequent generations of the line have been grown and hand-pollinated with observations again made for uniformity.

Variety PH4TF was derived by pedigree selection from the single cross hybrid PHG86 (Certificate No. 8700170) X PHW52 (Certificate No. 8800215).

Variety PH3RC has shown uniformity and stability for all traits as described in Exhibit C - "Objective Description of Variety". It has been self-pollinated and ear-rowed 9 generations with careful attention paid to selection criteria and uniformity of plant type to assure genetic homozygosity and phenotypic stability. The line has been increased both by hand and in isolated fields with continued observations for uniformity and stability, and for 6 generations during the final stages of inbred development and seed multiplication. Very high standards for genetic purity have been established morphologically using field observations and electrophoretically using sound lab molecular marker methodology.

No variant traits have been observed or are expected in PH3RC.

The criteria used in the selection of PH3RC were yield, both per se and in hybrid combinations; late season plant health, grain quality, stalk lodging resistance, and kernel size, especially important in production. Other selection criteria include: ability to germinate in adverse conditions; disease and insect resistance; pollen yield and tassel size.

Season/Year Pedigree Grown	Inbreeding Level of Pedigree Grown
May/1992 PHHB4	F0
May/1992 PHFT4	F0
Oct/1992 PHHB4/PHFT4	F1
May/1993 PHHB4/PHFT4)X	F2
May/1994 PHHB4/PHFT4)X8	F3
Oct/1994 PHHB4/PHFT4)X85	F4
Jun/1995 PHHB4/PHFT4)X853	F5
Oct/1995 PHHB4/PHFT4)X8532	F6
Apr/1996 PHHB4/PHFT4)X85323	F7
Oct/1996 PHHB4/PHFT4)X853231	F8
Apr/1997 PHHB4/PHFT4)X8532311	F9
Oct/1997 PHHB4/PHFT4)X85323114	F10
Apr/1998 PHHB4/PHFT4)X853231141	F11
PHHB4/PHFT4)X853231141X	F12

*PH3RC was selfed and ear-rowed from F3 through F11 generation.

#Uniformity and stability were established from F6 through F11 generation and beyond when seed supplies were increased.

Exhibit B: Novelty Statement

Variety PH3RC mostly resembles Pioneer Hi-Bred International, Inc. proprietary inbred line PHEG9 (PVP Certificate No. 9400090). Tables 1A and 1B show two sample t-tests on data collected primarily in Johnston, Ankeny, and Dallas Center, IA. The traits collectively show measurable differences between the two varieties.

Variety PH3RC has a narrower tassel branch angle (25.1 vs 66.2) than variety PHEG9 (Table 1A, 1B). This large difference is also supported by the images in Figure 1.

PH3RC has a greater plant height (237.4 cm vs 216.7 cm) than PHEG9 (Tables 2A and 2B).

PH3RC has a higher pollen score (4.3 vs 2.8) than PHEG9.

PH3RC has a lower tassel attitude score (2.8 vs 4.0) than PHEG9.

Definitions:**POLSC = POLLEN SCORE.**

- A 1 to 9 visual rating indicating the amount of pollen shed. The higher the score the more pollen shed.

TASSATT = TASSEL ATTITUDE

- A 1 to 5 visual rating indicating the vertical or horizontal projection of the primary tassel branches relative to the main axis. The lower the number, the more vertical the branches project. The higher the number, the more horizontal or droopy the branches project.

As I indicated in our last correspondence, we are submitting lab SSR molecular marker data to further support our case for distinction (see Figure 2 and Table 5 and accompanying text).

Exhibit B: Novelty Statement Tables

Table 1A: Data from Johnston, Ankeny, and Dallas Center, IA broken out by year are supporting evidence for differences between PH3RC and PHEG9. A two-sample t-test was used to compare differences between means.

Trait	Year	Variety -1	Variety Count 1	Count 2	Mean 1	Mean 2	Mean Diff 1-2	StdDeviation 1	StdDeviation 2	StdError 1	StdError 2	DF Pooled	t-Value Pooled	Prob. (2- tail) Pooled
Tassel Branch Angle (Degrees)	1999	PH3RC	15	15	22.6	43.6	-21.0	11.281	17.162	2.913	4.431	28	-4.0	0.000
Tassel Branch Angle (Degrees)	2001	PH3RC	10	10	23.9	64.8	-40.9	14.004	17.819	4.428	5.635	18	-5.7	0.000
Tassel Branch Angle (Degrees)	2002	PH3RC	30	30	26.7	77.9	-51.2	13.105	25.951	2.393	4.738	58	-9.6	0.000

Exhibit B. Novelty Statement Tables

Table 1B: Summary data from Johnston, Ankeny, and Dallas Center, IA across years and environments are supporting evidence for differences between PH3RC and PHEG9. Environments had different planting dates and were in different fields. A two-sample t-test was used to compare differences between means.

TASSEL BRANCH ANGLE (DEGREES)	VARIETY 1	VARIETY 2	Count	Mean 1	Mean 2	Mean Diff	Std Deviation 1	Std Deviation 2	StdError 1	StdError 2	DF	Pooled Value	Prob (2- tail)
	PH3RC	PHEG9	55	25.1	66.2	-41.1	12.701	26.632	1.713	3.591	108	-10.3	0.000

Exhibit B: Novelty Statement Tables

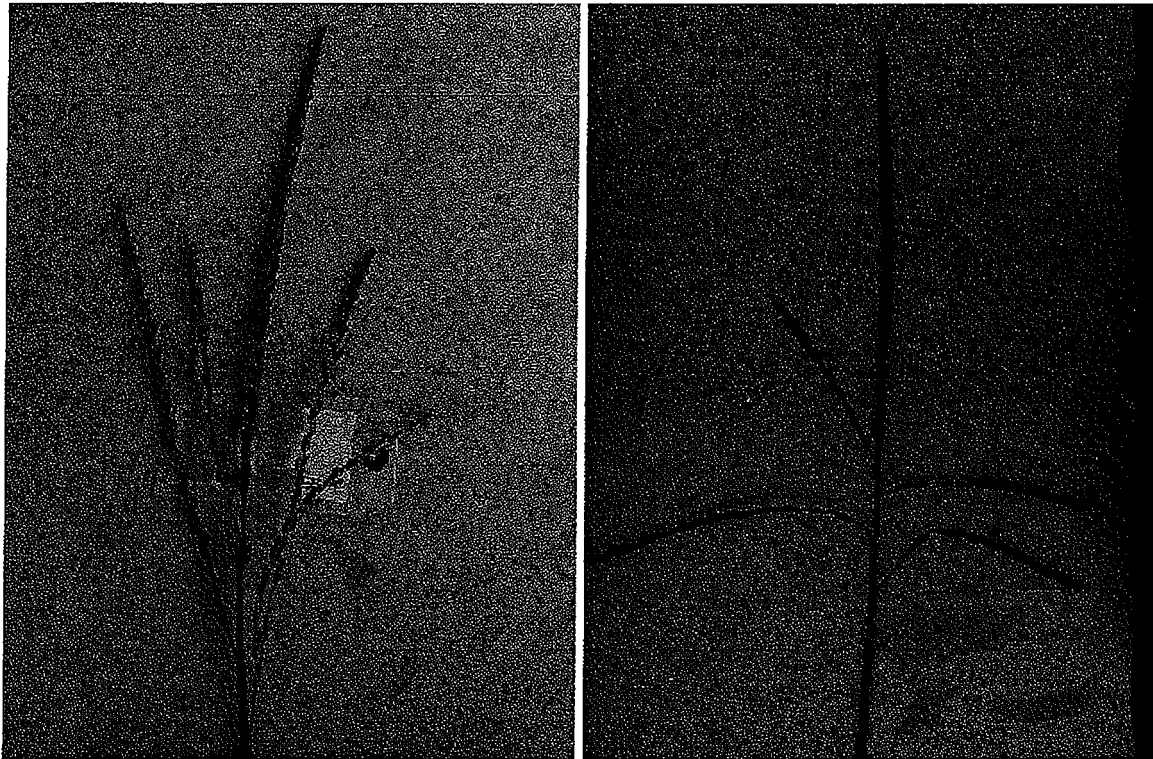
Table 2A: Data from Johnston, Ankeny, and Dallas Center, IA broken out by year and across environments are supporting evidence for differences between PH3RC and PHEG9. Each year varieties were grown in 3 locations that had different environmental conditions. Environments had different planting dates and were in different fields. A two-sample t-test was used to compare differences between means.

TRAIT	YEAR	VARIETY	Count	Mean	Mean	Mean Diff	StdDeviation	StdDeviation	StdError	StdError	Value	DF	DF Pooled	Value Pooled	DF Pooled
PLTHT	1999	PH3RC	15	222.2	211.5	10.7	15.368	7.652	3.968	1.976	28	28	28	2.4	0.023
PLTHT	2001	PH3RC	15	232.7	215.7	16.9	12.093	10.443	3.122	2.696	28	28	28	4.1	0.000
PLTHT	2002	PH3RC	15	254.9	222.7	32.2	8.811	13.962	2.275	3.605	28	28	28	7.6	0.000

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Exhibit B. Novelty Statement Figures

Figure 1: Images support differences in tassel branch angle between PH3RC and PHEG9.



PH3RC

PHEG9

As I indicated in our last correspondence, we are submitting lab SSR molecular marker data to further support our case for distinction. By looking at SSR marker data we can distinguish differences in genotype. Scoring of marker genotype is based on the size of the amplified fragment, which may be measured by the number of base pairs of the fragment. While variation in the primer used or in laboratory procedures can affect the number of base pairs reported, relative values should remain constant regardless of the specific primer or laboratory used. When comparing lines it is preferable if all SSR profiles are performed in the same lab. The SSR analyses reported herein were conducted in-house at Pioneer Hi-Bred.

A standard set of SSR markers were used to genetically profile the inbreds PH3RC and PHEG9. The genetic profile data showed that a genetically distinct segment of the genome on chromosome 3 was inherited from different germplasm sources. The segment was over 299 cM long (approximately 1/3 of the chromosome) on the published IBM2 Neighbors map (Figure 2). Composite public physical maps can be found at (<http://www.maizegdb.org/>). The public polymorphic markers that define this distinct segment are listed (Table 5). For PH3RC the segment was inherited from a source other than PHEG9 and the alleles are genetically different. This particular segment includes at least 39 publicly listed genes indicating that this chromosome segment is of functional significance. However, this segment undoubtedly contains many other genes, as the maize genome has recently been reported to contain over 59,000 functional genes (http://www.eurekalert.org/pub_releases/2004-10/rtu-rr0101204.php). The total map distance for the IBM2 Neighbors map is 7444 cM. If maize genes were randomly distributed, this would result in approximately 8 genes per cM, and 2392 genes in this 299 cM segment.

Table 5. SSR marker data for variety PH3RC and PHEG9 on chromosome 3.

Public Marker	Chromosome Number	Position IBM2 Neighbors	PH3RC base pairs	PHEG9 base pairs
PHI029 (tpi4)	3	192	158	147
BNLG1951	3	482	131	121
BNLG1160	3	491	220	222

Chromosome 3 comparison of PH3RC and PHEG9

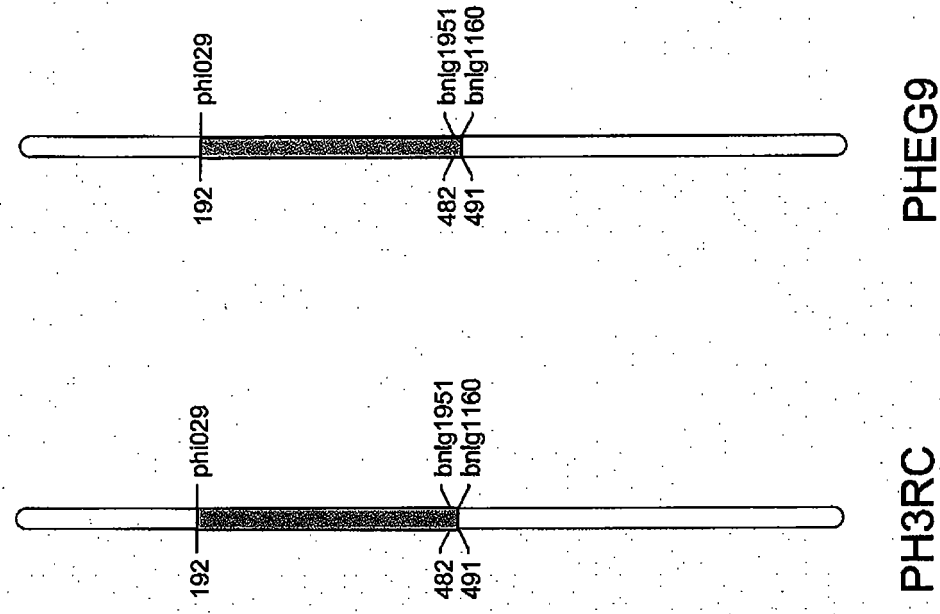


Figure 2. A polymorphic recombination segment on chromosome 3 shows a clear genetic difference between PH3RC and the most similar line PHEG9.

Answers to PVPO QA questions for DNA fingerprinting evidence:

- (1) The experimental design or procedures followed are published and cited.

Primers used for the SSRs reported are publicly available and may be found in the Maize GDB using the World Wide Web prefix followed by maizegdb.org (maintained by the USDA Agricultural Research Service), in Sharopova et al. (Plant Mol. Biol. 48(5-6):463-481), Lee et al. (Plant Mol. Biol. 48(5-6); 453-461), (<http://www.maizegdb.org/>).

The primers for these specific markers are listed:

BNLG1951 <http://www.maizegdb.org/cgi-bin/displaylocusrecord.cgi?id=145037>

BNLG1160 <http://www.maizegdb.org/cgi-bin/displaylocusrecord.cgi?id=144826>

PHI029 <http://www.maizegdb.org/cgi-bin/displaylocusrecord.cgi?id=12683>

- (2) The experimental design or procedures (or portions thereof) can not be confidential.

The Peer reviewed methodology for SSR loci as molecular markers is cited below from this publication:

Smith et al (1997) An evaluation of the utility of SSR loci as molecular markers in maize (*Zea mays* L.): comparisons with data from RFLPs and pedigree. Theor Appl Genet 95: 163-173

- (3) The specific differentiating bands are cited.

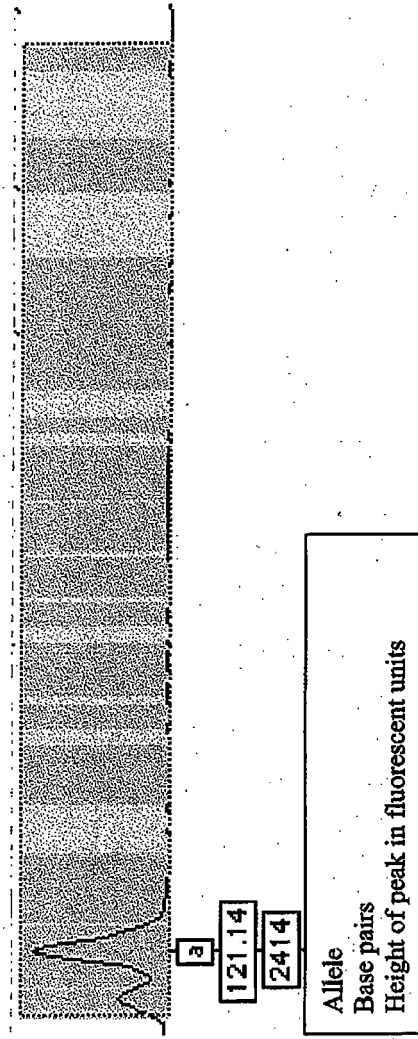
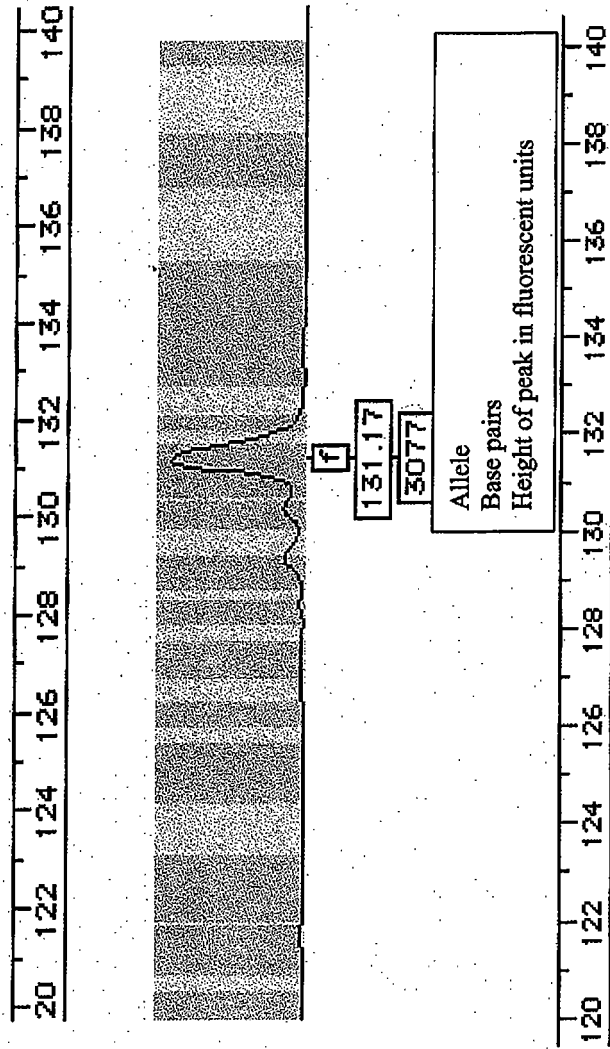
3. Please refer to Table 5 and Figure 2

- (4) Photographic copies [of gels or other results] of scientific publishable quality with sufficient resolution and labeling to resolve the individual bands in question are provided;

4. We have included an example of the differentiating bands from the electropherogram for marker BNLG1951 (Figure 3).

- (5) The procedure is well established and currently acceptable, or if novel, the results are from at least two independent laboratories with the experimental design appearing reliable.

5. See 1 and 2 above.



BNLG1951

Figure 3. Electropherogram data for marker BNLG1951

Exhibit C
(Corn Maize)

United States Department of Agriculture, Agricultural Marketing Service
Science Division, Plant Variety Protection Office
National Agricultural Library Building, Room 500
Beltsville, MD 20705

Objective Description of Variety
Corn (Zea mays L.)

Name of Applicant (s) Pioneer Hi-Bred International, Inc.	Variety Seed Source	Variety Name or Temporary Designation PH3RC
Address (Street & No., or RFD No., City, State, Zip Code and Country) 7301 NW 62nd Avenue, P.O. Box 85, Johnston, Iowa 50131-0085		FOR OFFICIAL USE PVP0 Number 200200257
Place the appropriate number that describes the varietal characters typical of this inbred variety in the spaces below. Right justify whole numbers by adding Leading zeroes if necessary. Completeness should be striven for to establish an adequate variety description. Traits designated by an "*" are considered Necessary for an adequate variety description and must be completed.		
COLOR CHOICES (Use in conjunction with Munsell color code to describe all color choices: describe #25 and #26 in Comments section):		
01=Light Green	06=Pale Yellow	11=Pink
02=Medium Green	07=Yellow	12=Light Red
03=Dark Green	08=Yellow Orange	13=Cherry Red
04=Very Dark Green	09=Salmon	14=Red
05=Green-Yellow	10=Pink-Orange	15=Red & White
		16=Pale Purple
		17=Purple
		18=Colorless
		19=White
		20=White Capped
		21=Buff
		22=Tan
		23=Brown
		24=Bronze
		25=Variegated (Describe)
		26=Other (Describe)
STANDARD INBRED CHOICES		
(Use the most similar (in background and maturity) of these to make comparisons based on grow-out trial data):		
Yellow Dent Families:		
Family	Members	
B14	CM105, A632, B64, B68	
B37	B37, B76, H84	
B73	N192, A679, B73, NC268	
C103	Mo17, Va102, Va35, A682	
Oh43	A619, MS71, H99, Va26	
WF9	W64A, A554, A654, Pa91	
Yellow Dent (Unrelated):		Sweet Corn:
Co109, ND246,		C13, Iowa5125, P39, 2132
Oh7, T232,		
W117, W153R,		Popcorn:
W18BN		SG1533, 4722, HP301, HP7211
White Dent:		Pipecorn:
C166, H105, Ky228		Mo15W, Mo16W, Mo24W

Groups on Lynx/Osborn/Grunst/98-99PVP

EXHIBIT C: PH3RC

1. TYPE: (describe intermediate types in Comments section):			Standard Variety Name		
2	1=Sweet 2=Dent 3=Flint 4=Flour 5=Pop 6=Ornamental	Dent	B73		
2. REGION WHERE DEVELOPED IN THE U.S.A.:			Standard Seed Source		
5	1=Northwest 2=Northcentral 3=Northeast 4=Southeast 5=Southcentral 6=Southwest 7=Other		PI 550473		
3. MATURITY (In Region of Best Adaptability; show Heat Unit formula in 'Comments' section)			DAYS HEAT UNITS		
DAYS	HEAT UNITS		DAYS	HEAT UNITS	
075	1,474.3	From emergence to 50% of plants in silk	075	1,451.2	
075	1,460.2	From emergence to 50% of plants in pollen	074	1,432.8	
004	0,097.0	From 10% to 90% pollen shed	003	0,069.8	
		From 50% silk to optimum edible quality			
		From 50% silk to harvest at 25% moisture			
4. PLANT:			Standard Sample		
			Deviation	Size	
235.3	cm Plant Height (to tassel tip)	14.62	11	229.0	18.65
076.2	cm Ear Height (to base of top ear node)	12.18	11	095.2	11.92
015.3	cm Length of Top Ear Internode	01.60	11	015.5	01.78
0.0	Average Number of Tillers/plant	00.03	11	0.0	00.02
0.9	Average Number of Ears per Stalk	00.19	11	1.0	00.07
4	Anthocyanin of Brace Roots: 1=Absent 2=Faint 3=Moderate 4=Dark 5=Very Dark			4	
5. LEAF:			Standard Sample		
			Deviation	Size	
10.0	cm Width of Ear Node Leaf	00.99	11	09.5	00.52
82.2	cm Length of Ear Node Leaf	05.33	11	84.3	05.65
07	Number of leaves above top ear	00.76	11	06	00.82
22	Degrees Leaf Angle (measure from 2nd leaf above ear at anthesis to stalk above leaf)	09.21	11	21	14.84
03	Leaf Color (Munsell code)	5GY3.4		03	5GY3.4
2	Leaf Sheath Pubescence (Rate on scale from 1=none to 9=like peach fuzz)			2	
	Marginal Waves (Rate on scale from 1=none to 9=many)				
	Longitudinal Creases (Rate on scale from 1=none to 9=many)				
6. TASSEL:			Standard Sample		
			Deviation	Size	
04	Number of Primary Lateral Branches	00.55	11	08	00.90
26	Branch Angle from Central Spike	08.41	11	17	06.64
60.4	cm Tassel Length (from top leaf collar node to tassel tip)	02.97	11	54.6	03.25
4	Pollen Shed (rate on scale from 0=male sterile to 9=heavy shed)			6	
11	Anther Color (Munsell code)	2.5R5.8		07	5Y8.5
14	Glume Color (Munsell code)	10RP3.8		01	5GY5.6
1	Bar Glumes (Glume Bands): 1=Absent 2=Present			1	
Application Variety Data			Standard Variety Data		

7a. EAR (Unhusked Data):

- 11 Silk Color (3 days after emergence) (Munsell code) 5R58
01 Fresh Husk Color (25 days after 50% silking) (Munsell code) 2.5GY7/6
21 Dry Husk Color (65 days after 50% silking) (Munsell code) 5Y92
1 Position of Ear at Dry Husk Stage: 1= Upright 2= Horizontal 3= Pendant
5 Husk Tightness (Rate of Scale from 1=very loose to 9=very tight)
2 Husk Extension (at harvest): 1=Short (ears exposed) 2=Medium (<8 cm)
 3=Long (8-10 cm beyond ear tip) 4=Very Long (>10 cm)

01 2.5GY94
01 5GY7/8
21 2.5Y8.54
2
7
3

7b. EAR (Husked Ear Data):

- 17.5 cm Ear Length
42.6 mm Ear Diameter at mid-point
138.8 gm Ear Weight
15 Number of Kernel Rows
2 Kernel Rows: 1=Indistinct 2=Distinct
2 Row Alignment: 1=Straight 2=Slightly Curved 3=Spiral
08.2 cm Shank Length
2 Ear Taper: 1=Slight 2= Average 3=Extreme

Standard Sample
Deviation Size

Standard Sample
Deviation Size

01.37 11
01.75 11
30.57 11
00.92 11

01.25 11

13.5 01.13 11
44.8 01.72 11
112.8 18.10 11
17.7 00.90 11
2
2
08.9 02.07 11
2

8. KERNEL (Dried)

- 10.9 mm Kernel Length
08.1 mm Kernel Width
04.9 mm Kernel Thickness
58.0 % Round Kernels (Shape Grade)
1 Aleurone Color Pattern: 1-Homozygous 2=Segregating
07 Aleurone Color (Munsell code)
07 Hard Endosperm Color (Munsell code)
03 Endosperm Type:
 1=Sweet (Su1) 2=Extra Sweet (sh2) 3=Normal Starch
 4=High Amylose Starch 5=Waxy Starch 6=High Protein
 7=High Lysine 8=Super Sweet (se) 9=High Oil
 10=Other...

Standard Sample
Deviation Size

Standard Sample
Deviation Size

00.70 11
00.30 11
00.54 11
17.33 11

1.25Y7/12
1.25Y8/12
1.25Y8/12

11.0 00.45 11
07.3 00.47 11
04.2 00.60 11
45.2 26.33 11
1
07 2.5Y8/12
07 1.25Y8/12
3 1.25Y8/12

- 30.6 gm Weight per 100 Kernels (unsized sample)

03.41 11

23.91 03.56 11

9. COB:

- 24.5 mm Cob Diameter at mid-point
14 Cob Color (Munsell code) 10R56

Standard Sample
Deviation Size

Standard Sample
Deviation Size

00.82 11

27.6 01.03 11
14 10R66

10. DISEASE RESISTANCE (Rate from 1 (most susceptible) to 9 (most resistant);
leave blank if not tested; leave Race or Strain Options blank if polygenic):

A. Leaf Blights, Wilts, and Local Infection Diseases

	Anthrachnose Leaf Blight (<i>Colletotrichum graminicola</i>)	
<u>5</u>	Common Rust (<i>Puccinia sorghi</i>)	<u>4</u>
	Common Smut (<i>Ustilago maydis</i>)	
	Eyespot (<i>Kabatiella zeae</i>)	
	Goss's Wilt (<i>Clavibacter michiganense</i> spp. <i>nebraskense</i>)	
<u>5</u>	Gray Leaf Spot (<i>Cercospora zeae-maydis</i>)	<u>3</u>
	Helminthosporium Leaf Spot (<i>Bipolaris zeicola</i>) Race _____	
<u>5</u>	Northern Leaf Blight (<i>Exserohilum turcicum</i>) Race _____	<u>2</u>
<u>7</u>	Southern Leaf Blight (<i>Bipolaris maydis</i>) Race _____	<u>3</u>
	Southern Rust (<i>Puccinia polysora</i>)	
<u>4</u>	Stewart's Wilt (<i>Erwinia stewartii</i>)	<u>3</u>
	Other (Specify) _____	

B. Systemic Diseases

	Corn Lethal Necrosis (MCMV and MDMV)	
<u>9</u>	Head Smut (<i>Sphacelotheca reiliana</i>)	<u>9</u>
	Maize Chlorotic Dwarf Virus (MDV)	
	Maize Chlorotic Mottle Virus (MCMV)	
<u>3</u>	Maize Dwarf Mosaic Virus (MDMV)	<u>3</u>
	Sorghum Downy Mildew of Corn (<i>Peronosclerospora sorghi</i>)	
	Other (Specify) _____	

C. Stalk Rots

<u>3</u>	Anthrachnose Stalk Rot (<i>Colletotrichum graminicola</i>)	<u>3</u>
	Diplodia Stalk Rot (<i>Stenocarpella maydis</i>)	
	Fusarium Stalk Rot (<i>Fusarium moniliforme</i>)	
	Gibberella Stalk Rot (<i>Gibberella zeae</i>)	
	Other (Specify) _____	

D. Ear and Kernel Rots

	Aspergillus Ear and Kernel Rot (<i>Aspergillus flavus</i>)	
<u>8</u>	Diplodia Ear Rot (<i>Stenocarpella maydis</i>)	<u>6</u>
<u>5</u>	Fusarium Ear and Kernel Rot (<i>Fusarium moniliforme</i>)	<u>7</u>
<u>9</u>	Gibberella Ear Rot (<i>Gibberella zeae</i>)	<u>9</u>
	Other (Specify) _____	

11. INSECT RESISTANCE (Rate from 1 (most susceptible) to 9 (most resistant); (leave blank if not tested) :

Banks grass Mite (*Oligonychus pratensis*)
 Corn Worm (*Helioverpa zea*)
 Leaf Feeding
 Silk Feeding
 mg larval wt.
 Ear Damage
 Corn Leaf Aphid (*Rhopalosiphum maidis*)
 Corn Sap Beetle (*Carpophilus dimidiatus*)
 European Corn Borer (*Ostrinia nubilalis*)
 1st Generation (Typically Whorl Leaf Feeding)
 2nd Generation (Typically Leaf Sheath-Collar Feeding)
 Stalk Tunneling
 cm tunneled/plant
 Fall Armyworm (*Spodoptera frugiperda*)
 Leaf Feeding
 Silk Feeding
 mg larval wt.
 Maize Weevil (*Sitophilus zeamaze*)
 Northern Rootworm (*Diabrotica barberi*)
 Southern Rootworm (*Diabrotica undecimpunctata*)
 Southwestern Corn Borer (*Diatraea grandiosella*)
 Leaf Feeding
 Stalk Tunneling
 cm tunneled/plant
 Two-spotted Spider Mite (*Tetranychus urticae*)
 Western Rootworm (*Diabrotica virgifera virgifera*)
 Other (Specify) _____

12. AGRONOMIC TRAITS:

<u>5</u>	Staygreen (at 65 days after anthesis) (Rate on a scale from 1=worst to excellent)	<u>3</u>
<u>0.0</u>	% Dropped Ears (at 65 days after anthesis)	<u>0.0</u>
	% Pre-anthesis Brittle Snapping	
	% Pre-anthesis Root Lodging	
<u>0.0</u>	Post-anthesis Root Lodging (at 65 days after anthesis)	<u>0.0</u>
<u>5,768.7</u>	Kg/ha Yield of Inbred Per Se (at 12-13% grainmoisture)	<u>5,460.3</u>

13. MOLECULAR MARKERS: (0=data unavailable; 1=data available but not supplied; 2=data supplied):

1 Isozymes

0 RFLP's

0 RAPD's

COMMENTS (eg. state how heat units were calculated, standard inbred seed source, and/or where data was collected. Continue in Exhibit D):

CLARIFICATION OF DATA IN EXHIBITS B AND C

Please note the data presented in Exhibit B and C, "Objective Description of Variety," are collected primarily at Johnston, Ankeny, and Dallas Center, Iowa. The data in Tables 1A and 1B are from two sample t-tests using data collected in Johnston, Ankeny and Dallas Center, IA. These traits in exhibit B collectively show distinct differences between the two varieties.

The data collected in exhibit C was collected in 1997, 1999, 2000 and 2001 for page 1 and 2. There were 3 different planting dates planted for these trials. There are environmental factors that differ from year to year and from planting date to planting date. Environmental temperature and precipitation differences during the vegetative and grain fill periods can impact plant and grain traits, and are a source of variability. The environmental conditions described above could result in larger standard deviations. The variation associated with environment to environment is normally higher than the variation associated within locations. Also, the ear and sizing traits can vary depending on how well pollinated the ears are and how consistent the weather is during the grain fill period. I have enclosed a table that shows monthly temperature and precipitation in 1997, 1999, 2000, and 2001.

C
 Exhibit **D**. Temperature and Precipitation differences from Ankeny, IA

TEMPERATURE

YEAR	MAY	JUN	JULY	AUG	AVERAGE
1994	59.8	70.7	71.9	69.0	67.9
1995	56.2	69.4	74.3	76.9	69.2
1996	56.2	69.3	71.3	70.5	66.8
1997	53.5	70.6	74.1	69.6	67.0
1998	64.7	66.6	74.8	73.5	69.9
1999	60.7	69.7	78.7	70.5	69.9
2000	63.5	68.9	73.2	74.2	70.0
2001	61.3	69.0	76.7	74.2	70.3
2002	57.7	73.5	77.9	71.7	70.2

RAINFALL

YEAR	MAY	JUN	JULY	AUG	Total
1994	3.67	5.75	1.71	4.18	15.31
1995	5.04	4.19	2.94	2.87	15.04
1996	8.47	4.35	2.51	2.14	17.47
1997	4.32	3.27	4.10	1.36	13.05
1998	6.46	11.07	5.70	4.96	28.19
1999	6.46	4.54	4.45	6.55	21.85
2000	5.40	5.80	3.16	1.78	16.14
2001	5.72	3.87	2.05	1.92	13.56
2002	2.91	2.78	5.34	4.00	15.03

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426).

EXHIBIT E
STATEMENT OF THE BASIS OF OWNERSHIP

1. NAME OF APPLICANT(S) PIONEER HI-BRED INTERNATIONAL, INC.	2. TEMPORARY DESIGNATION OR EXPERIMENTAL NUMBER	3. VARIETY NAME PH3RC
4. ADDRESS (Street and No., or R.F.D. No., City, State, and ZIP, and Country) 7301 NW 62nd AVENUE P.O. BOX 85 JOHNSTON, IA 50131-0085	5. TELEPHONE (include area code) 515-270-4051	6. FAX (include area code) 515-253-2125
7. PVPO NUMBER 200200257		

8. Does the applicant own all rights to the variety? Mark an "X" in appropriate block. If no, please explain: ☒ YES ☐ NO

9. Is the applicant (individual or company) a U.S. national or U.S. based company? ☒ YES ☐ NO

If no, give name of country

10. Is the applicant the original owner? ☒ YES ☐ NO If no, please answer one of the following:

a. If original rights to variety were owned by individual(s), is(are) the original owner(s) a U.S. national(s)?

☐ YES ☐ NO If no, give name of country

b. If original rights to variety were owned by a company(ies), is(are) the original owner(s) a U.S. based company?

☒ YES ☐ NO If no, give name of country

11. Additional explanation on ownership (if needed, use reverse for extra space):

PH3RC is owned by Pioneer Hi-Bred International, Inc.

Pioneer Hi-Bred International, Inc. (PHI), Des Moines, Iowa, and/or its wholly owned subsidiary Pioneer Overseas Corporation (POC), Des Moines, Iowa, is the employer of the plant breeders involved in the selection and development of PH3RC. Pioneer Hi-Bred International and/or Pioneer Overseas Corporation has the sole rights and ownership of PH3RC pursuant to written contracts that assign all rights in the variety to PHI and/or POC at the time such variety was created. No rights to this variety are retained by any individuals.

PLEASE NOTE:

Plant variety protection can be afforded only to owners (not licensees) who meet one of the following criteria:

1. If the rights to the variety are owned by the original breeder, that person must be a U.S. national, national of a UPOV member country, or national of a country which affords similar protection to nationals of the U.S. for the same genus and species.
2. If the rights to the variety are owned by the company which employed the original breeder(s), the company must be U.S. based, owned by nationals of a UPOV member country, or owned by national of a country which affords similar protection to nationals of the U.S. for the same genus and species.
3. If the applicant is an owner who is not the original owner, both the original owner and the applicant must meet one of the above criteria.

The original breeder/owner may be the individual or company who directed final breeding. See section 41(a)(2) of the Plant Variety Protection Act for definition.

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